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(71) Applicant *(for all designated States except US)*: **COMPAGNIE GERVAIS DANONE** [FR/FR]; 17, boulevard Haussmann, F-75009 Paris (FR).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **NOBLE, Olivier** [FR/FR]; 11 rue des Pommiers, F-91400 Orsay (FR). **LE DOUARON, Morgane** [FR/FR]; 82 avenue Daumesnil, F-75012 Paris (FR).

(74) Agent: **WARCOIN, Jacques**; CABINET REGIMBEAU, 20 rue de Chazelles, F-75847 Paris Cedex 17 (FR).

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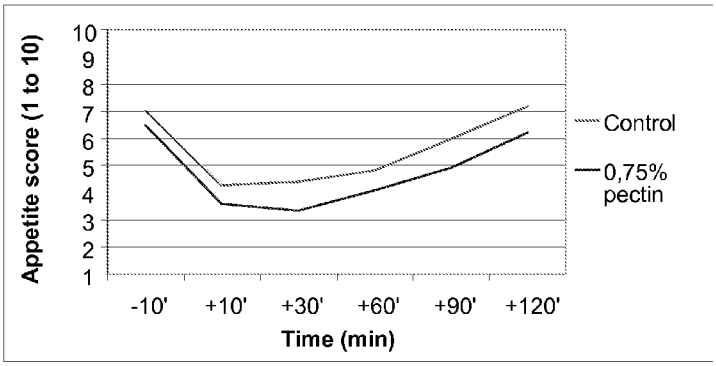

FIGURE 1

(57) Abstract: The present invention relates to the use of a liquid beverage with a pH between about 3.5 and 5, comprising: a. low-methoxylated amidated pectin, and b. less than 20 mg calcium per liter, as a satiating beverage for humans The present invention further relates to the use of low-methoxylated amidated pectin in the manufacture of a liquid beverage for inducing satiety in humans, said beverage having a pH between about 3.5 and 5, and comprising less than 20 mg calcium per liter. The present invention further relates to preparation methods and uses of such a beverage.

ACIDIC BEVERAGE CONTAINING LOW-METHOXYL AMIDATED PECTIN AND NO ADDED CALCIUM FOR A SATIETY EFFECT

FIELD OF THE INVENTION

The present invention relates to the field of functional beverages, in particular beverages useful for dietetic or therapeutic purposes via an effect on appetite, well-being or health in mammals, preferably in humans.

BACKGROUND OF THE INVENTION

During the last two decades, we have witnessed a genuine explosion in the number of individuals suffering from excess weight and from obesity. This phenomenon has spread beyond the borders of the developed countries and currently affects all age brackets on practically all continents.

In 2004, obesity affected more than 300 million individuals throughout the world. In 2005, in the United States, more than 65% of the population was overweighed and amongst them almost 31% obese. Mexico is the second most affected country in the world, behind the United States. China is also affected, with an increasing incidence of obesity, especially in the young. In the poorest countries, obesity even represents a sign of social success and is thus given high value.

Childhood obesity is a major problem: acquired before 5 years of age, it can persist into adulthood. In France, in 1965, only 3% of school age children were obese. The figure was 13.3% in 2000.

Excess weight and obesity are known today to increase the risk of developing chronic diseases such as cardiovascular and respiratory diseases (e.g., sleep apnea), type 2 diabetes, hypertension, osteoarthritis

and certain forms of cancer (e.g., hormone-dependant and gastrointestinal cancers).

Obesity is a multifactor disease, combining in particular genetic and environmental factors. The recent explosion in the number of obese is generally correlated with modern lifestyle: excessive, irregular or unbalanced diet, with a tendency to snack and to consume sweetened and fatty products (sweets, chips, snacks, sodas, etc.); sedentary lifestyle; stress; and other factors.

Raising the public's awareness of healthier living, initiated by medical and social advocates, has become an issue for politicians who today encourage public information and support campaigns aimed at the very young, in particular school age children. Moreover, obesity was recognized as a disease in 1997 by the World Health Organization (WHO), which currently places its prevention and treatment as a priority in the field of nutritional pathology.

Thus, a general awareness of the impact of diet on health has been established in the past few years. The desire is indeed to eat better in order to live better.

The issues of well-being and public health are quite evidently at the core of the concerns of the food and beverage industries, which have thus very quickly invested in the development of products adapted to changes in consumer dietary behavior, which are more than ever directed to "health foods" that are less rich, more balanced, and healthful.

In this context, various foods and beverages have already been proposed.

For example, food compositions containing pectin and/or alginate, containing a calcium salt that is insoluble at neutral pH, were disclosed in international applications WO 03/053165 and

WO 03/053169 in the name of N.V. NUTRICIA, published on July 3, 2003. These compositions are liquid at a pH higher than 6, and gel in the stomach through cross-linking of pectin and/or alginate by the calcium salt solubilized at acidic pH. The process of gelling of fibers under the effect of calcium starts as soon as pH drops below 5.

However, foods whose pH exceeds 5 or 6 are a hazard in terms of safety, notably related to the capacity of certain pathogenic microorganisms to survive under such conditions. At such pH values, the food and beverage industries are subject to burdensome and costly operational constraints, in particular related to sterilization, to prevent these hazards.

McNeil Nutritionals LLC has filed a number of patent applications on separate systems for administering a composition containing soluble anionic fibers (pectins, alginates, etc.) and a composition containing soluble cations (for example, WO 2007/044663, WO 2007/044638, WO 2007/044665). However, multiphase systems are not very practical to implement.

Japanese patent application JP 2000-189109 in the name of Terumo Corp., published on July 11, 2000, discloses a semi-fluid food preparation containing dextrin and pectin, able to form a gel at a pH lower than 3. This fiber-rich preparation regulates blood sugar level; it is proposed to prevent and treat obesity, diabetes and other related or similar conditions. However, the preparation thus proposed is more of a drinkable gel than a genuine beverage in the context of European consumers, for example, who reject textures that are too thick, unlike Japanese consumers who are accustomed to drinking relatively textured preparations.

Thus, there is a genuine need for functional beverages that are effective in maintaining or improving well-being and health and that do not have the disadvantages of existing beverages. In other words, there is today an unmet need for satiating functional beverages that are at the same time effective and: (i) sufficiently acid to avoid the risks of microbiological contamination; (ii) sufficiently simple to produce, package, store and consume to be of industrial and commercial interest; and (iii) sufficiently liquid to correspond to consumer tastes, in particular those of European consumers.

It is to this need that the object of the present invention responds.

The present invention provides a beverage which overcomes one or more of the abovementioned disadvantages.

It was found that a low pH beverage can be made at low calcium concentration, said beverage having a low viscosity in the bottle and when consumed, while providing a satiating effect after consumption. It was particularly unexpected that at very low concentrations of calcium, particularly without addition of significant amounts of for example calcium salts, still a satiety effect could be obtained. This finding also enabled the production of a low pH beverage, which is highly desirable for taste and food safety reasons.

Without wishing to be bound by theory, the present inventors believe that after consumption, the present drink increases in viscosity due to the lower pH in the stomach, causing a feeling of satiety.

DETAILED DESCRIPTION

It is specified, as preliminary remarks, that the various embodiments of the aspects of the present

invention described below can be alternatives or combined. Should they not be combined, that will be clearly indicated in the text. If they cannot be combined, that will be explicitly described or will be implicit but without any ambiguity for the persons skilled in the art within their general knowledge.

The present invention relates to the use of a liquid beverage with a pH between about 3.5 and 5, comprising:

a. low-methoxylated amidated pectin, and

b. less than 20 mg calcium per liter, as a satiating beverage for humans.

The present invention is further related to the use of low-methoxylated amidated pectin in the manufacture of a liquid beverage for inducing satiety in humans, said beverage having a pH between about 3.5 and 5, and comprising less than 20 mg calcium per liter.

The present invention also concerns a liquid beverage with a pH between about 3.5 and 5, comprising:

a. low-methoxylated amidated pectin, and

b. less than 20 mg calcium per liter.

The present invention is yet directed to uses of such a liquid beverage, as a snack to drink between meals, and/or as a supplement to the liquids consumed by a human in the course of a day, and/or as part of a diet, for example a low-calorie diet.

The present invention further relates to a method for preparing a liquid beverage with a pH between 3.5 and 5, wherein it comprises at least the steps of:

a. adding to an aqueous matrix at least one agent for controlling pH selected from the group consisting of citric acid, sodium citrate, o-phosphoric acid, sodium phosphate, malic acid, lactic acid and combinations thereof,

b. adding to the composition resulting from step a) at least one low-methoxylated amidated pectin under stirring;

c. heating the composition resulting from step b) to a temperature ranging from about 80 °C to about 140 °C for a period ranging from about 15 seconds to about 10 minutes.

Viscosity

A "liquid beverage" in the context of the present invention is a drinkable food product, acceptable for a Western consumer, notably a European consumer. Here, it is thus a solution that is sufficiently liquid or with little texture, which preferably excludes preparations such as drinkable gels or yogurts that are considered to be viscous or textured. Preferably, the present beverage has a viscosity below 20mPas at a shear rate of 50 s^{-1} and at a temperature of 25°C).

In the context of the present invention, it is important to note that viscosity should not be measured at a pH lower than 3.5 because at this pH it is a gel strength that is determined. Typically, at pH 3.5, there is a phase transition (passage from liquid state to gel state). So normally, above pH 3.5, a viscosity is measured; below a gel strength is measured.

Preferably, the present beverage has a viscosity equal to or below 20 mPa·s, more preferably below 15 mPa·s, even more preferably below 10 mPa.s, at a

shear rate of 50 s^{-1}, at a temperature of 25°C and at pH above 3.5, preferably at pH 5.

An example of a suitable protocol for rheological measurement uses an MCR 300 apparatus (Anton Paar) using a DG26.7 double-gap measurement system and US200/32 V2.43 software (Physica). Rheology measurements are carried out at 25 °C. The method consists in measuring the sensory viscosity in mPa·s while applying a shear rate of 0.1 s^{-1} to 50 s^{-1} (50 measurement points over 100 seconds). The result reflecting the sensory viscosity in the mouth corresponds to the value measured at 50 s^{-1}.

Preferably, when at pH below 3.5, e.g. at pH of 3, the present beverage has a gel strength between about 5 g and about 50 g. One method of measurement uses the following conditions, given here as an example. Into a 50 ml container (diameter 33 mm, height 70 mm) 20 ml of the solution to be analyzed are added, and then with a pipette 10 ml of a 0.1 N HCl solution is added in a homogeneous fashion. The container is closed and vigorously agitated before gelling occurs. The pectin gels in a few tens of seconds. Its consistency can then be measured by using a TAXT2 analyzer according to the protocol below.

Protocol for measuring gel strength in the TAXT2:

Probe:	½ Cyl Delin P/0.5
Load cell:	5 kg
Pre-test speed:	10 mm/s
Test speed:	2 mm/s
Post-test speed:	10 mm/s
Distance:	15 mm
Release:	AUTO
Force:	0.049 N

Of course, for all measurements of viscosity or gel strength, those skilled in the art will be able to

apply any other suitable method known to them, and to use any suitable means or device available to them.

pH

The present beverage is acidic, with a pH between about 3.5 and about 5. Preferably, the pH is between about 3.5 and about 4.5. Particularly preferred pH values are between about 3.5 and about 4.2, with a preferential value at about 3.9.

The low pH of the beverage according to the invention has at least two advantages: (i) it makes it possible to avoid the microbiological contaminations likely to occur with beverages of the prior art; and (ii) the acidity is associated with a sensation of freshness in the mouth, which is pleasant to and sought by the consumer.

Insofar as the pH value of the beverage is essential, and especially when the matrix is a plant juice, in particular a fruit juice, it may be useful to add a system that corrects the pH in order to place the beverage in the required pH ranges. This corrective system can be a suitable agent known for its capacity to control pH. Such agents exist commercially.

It has been noted by the Inventors that the drinkable preparations based on fibers already disclosed or available to date could have a viscosity too high to be suitable for the taste of Western consumers, in particular European consumers. Consequently, the Inventors sought to develop formulas sufficiently liquid to remain beverages at least acceptable, if not pleasant, to such a consumer. In this context, they found surprisingly that the viscosifying and texturing effect related to the presence of fibers could be mitigated under certain specific conditions. In particular, the use of suitable

pH control agents makes it possible to obtain sufficiently liquid beverages at low pH. Thus, the present beverage advantageously comprises at least one dietary agent for controlling pH, preferably an agent for controlling pH selected from citric acid, sodium citrate, o-phosphoric acid, sodium phosphate, malic acid, lactic acid and combinations thereof.

Preferably, the beverage, or the matrix of said beverage, further comprises at least one additive chosen among sweeteners, coloring agents, flavors, flavor enhancers, sugar, preservatives and combinations thereof.

In the context of the present invention, "flavors" means ingredients intended to give a flavor (i.e., a taste and/or an odor) to the beverage. As a general rule, flavors are used for two principal technological aims:

- either they enhance the natural flavor of the product, or partially restore it if it is too weak (products having lost part of their flavor during the manufacturing process); or
- they replace a food ingredient that is intended to provide a particular aromatic note to the finished product (for example, a fruit flavor).

Examples of flavors include: apple, orange, red berries, strawberry, peach, apricot, plum, raspberry, blackberry, currant, lemon, citrus fruit, grapefruit, banana, pineapple, kiwi, pear, cherry, coconut, passion fruit, mango (in particular the flavor Mango Passion Mane E513097), fig, rhubarb, melon, multi-fruit, exotic fruit, vanilla, chocolate, coffee and cappuccino.

"Coloring agents" mean herein substances able to render, enhance or confer a color to the beverage. Examples of coloring agents include: beta-carotene and

riboflavin (vitamin B2), as well as the conventional coloring agents listed in table 1 below.

Table 1

E100	Curcumin	E150a	Plain Caramel
E101 (i)	Riboflavine	E150b	Caustic sulphite caramel
E101 (ii)	Riboflavine-5'-phosphate	E150c	Ammonia caramel
E102	Tartrazine	E150d	Sulphite ammonia caramel
E104	Quinoline yellow	E151	Brilliant Black BN
E110	Suns and Yellow FCF	E153	Vegetable Carbon
E120	Cochineal, Carminic acid, Carmines	E155	Brown HT
E122	Carmoisine	E160a	Carotenes
E123	Amaranth	E160b	Annato, bixin, norbixin
E124	Ponceau 4R	E160c	Paprika extract
E127	Erythrosine	E160d	Lycopene
E128	Red 2G	E160e	Beta-apo-8'carotenal
E129	Allura Red AC	E160f	Ethyl ester of beta-apo-8' carotenic acid
E131	Patent Blue V	E161b	Lutein
E132	Indigotine	E161g	Canthaxanthin
E133	Brilliant Blue FCF	E162	Beetroot Red
E140	Chlorophylls and Chlorophyllins	E163	Anthocyanins
E141	Copper complexes of chlorophylls and chlorophyllins	E171	Titaniumdioxide
E142	Green S	E172	Iron oxides and hydroxides

"Sweeteners" means substances capable of mimicking the sweetening power of sugar, without providing the calories of sugar. Preferred sweeteners include: aspartame, acesulfame K, saccharin, sucralose and cyclamate.

"Preservatives" means substances intended to contribute to preservation by preventing the presence and the development of undesirable microorganisms (for

example, the molds or bacteria responsible for food poisoning) in the end product. Examples of preservatives that can be used include sorbic acid, ascorbic acid and sulfur dioxide.

"Flavor enhancers" are herein food additives that, although they do not have a pronounced flavor themselves, do not change the flavor but increase the intensity of the olfactory and gustatory perception (taste and/or odor) of the beverage. Examples include amino acids (E620 to E641), in particular monosodium glutamate E621. Sweeteners are sometimes regarded as flavor enhancers.

Aqueous matrix

The beverage of the present invention is preferably prepared using an aqueous matrix, i.e., a matrix preferably comprising, by weight, at least about 80% water, more preferably at least 90 wt% water based on total weight of the matrix.

Preferably, the present beverage comprises at least about 80 wt% water, more preferably at least 90 wt% water based on total weight of the beverage.

The matrix is preferably selected from water and combinations of water and plant juices such as vegetable or fruit juices. The matrix is more preferably water.

Preferably, the present beverage comprises plant juice, more preferably fruit juice. Embodiments may refer to a beverage "based on" fruit/vegetable juice, namely fruit/vegetable juice reconstituted from concentrate. However, the content in plant juice of the aqueous matrix or beverage preferably does not exceed about 15% wt to 20% wt based on the total weight of the beverage.

Thus, the "matrix" of the beverage, according to the present invention, means a water-based solution, optionally containing one or more plant juices, notably fruit juices, vegetable juices or fruit and/or vegetable juices, optionally reconstituted from concentrates. This matrix is preferably used herein as the starting material to which is added at least one low-methoxylated and amidated pectin. The "matrix" comprises, optionally, one or more substances such as, for example, sugar, flavors, coloring agents, sweeteners, antioxidants or preservatives.

Water thus represents the primary ingredient of the matrix. By "water" is meant H_2O. Preferably the present composition comprises a water suitable for preparing a beverage intended for human consumption. Preferably, a water selected from the group consisting of drinking water, spring water and mineral water, in particular natural mineral water, can be used. Since the mineralization of the water can influence the properties of the beverage, a mineral water with low mineral content (e.g., a soft water, such as Volvic) will be chosen. Thus, water with low calcium content will be preferred. Depending on the embodiments, the water can be flat or sparkling. In the latter case, either naturally sparkling water or artificially sparkling water can be chosen. Alternatively, the water could be treated osmotically or demineralized.

According to the present invention, "plant juice" means fruit and/or vegetable juices, or fruit and/or vegetable juices reconstituted from concentrate, or juices extracted from soya, tonyu, rice, oats, quinoa, chestnut, almond, hazelnut, etc.

Examples of fruit suitable for the preparation of an inventive beverage are: pear, strawberry, peach, pineapple, grape, apple, apricot, orange, banana,

mango, morello cherry, sweet cherry, plum, prune, blackberry, bilberry, raspberry, grapefruit, guava, kiwi, passion fruit, papaya, lemon, quince, cranberry, litchi, pomegranate and melon.

Preferably, the plant juice is fruit juice. Thus, according to one embodiment, the matrix of the beverage comprises between 0% and 20% fruit juice, preferentially between 10% and 20% fruit juice, even more preferably between 15% and 20% fruit juice.

Preferably, the present liquid composition comprises between 0 wt.% and 20 wt.% fruit juice, preferably between 1 wt.% and 20 wt.% fruit juice, even more preferably between 10 wt.% and 20 wt.% fruit juice.

Examples of fruit juices include orange juice, in particular NFC (not from concentrate) 10-12° Brix, or orange juice reconstituted from concentrate called FCOJ (frozen concentrate orange juice) at 66° Brix, as well as other concentrated fruit juices between 10° Brix and 70° Brix. Preferably, the fruit juice used is between 10° Brix and 70° Brix.

For reasons of feasibility, it is preferred that the calcium concentration in the matrix does not exceed about 20 mg/l. This concentration is advantageously between 0.01 mg/l and 15 mg/l, more particularly between 5 mg/l and 10 mg/l.

In the manufacture of the present beverage, preferably no calcium salt is added, more preferably no composition comprising at least 20 wt.% calcium salt is added. Hence, preferably the present composition is free of any source of soluble (or free) or insoluble calcium ions at the pH of manufacture, storage and consumption, apart from the calcium ions which might be provided or released by the matrix. Thus, the beverage

is prepared from a matrix to which no calcium salt or source thereof is further added.

Pectin

As indicated above, the present beverage comprises, as fibers, at least one "low-methoxylated and amidated pectin" (or "low-methoxyl amidated pectin"; LMA pectin). More particularly, such an LMA pectin has a degree of methylation less than or equal to about 50% and a degree of amidation no greater than about 25%. Preferably the present composition comprises LMA pectins are selected among citrus pectins, apple pectins and combinations thereof. In practice, those skilled in the art will be able to choose among suitable commercially available pectins, either standardized (in sugar or with a polydextrose that is calorie-free) or non-standardized (not containing sugar). For example, they will be able to use standardized pectin Genu LM 104 AF-FS (CP Kelco) or SF 560 (Danisco), non-standardized pectin Genu LM-104 Z (CP Kelco) or the non-standardized pectin used in the examples, with a mean degree of esterification of 33% and a mean degree of amidation of 18% (Danisco). Such fibers are particularly advantageous because they are liquid during the stages of manufacturing, packaging and storage and up to consumption of the beverage containing them. They gel when the pH drops below about 3.5, i.e., after ingestion, once they reach the stomach. Moreover, it was found that LMA pectins have the considerable advantage in the present composition, compared to other known fibers, of gelling at low pH without needing to be cross-linked through calcium ions. As a result, the gels obtained are preferably at least equivalent in strength to those obtained with conventional non-LMA pectins in the presence of soluble

calcium. The Inventors thus unexpectedly discovered that it is possible to prepare beverages based on fibers, having a pH lower than that of beverages of the state of the art, which in particular makes it possible to reduce or eliminate the hazards of microbiological contamination.

Preferably, the pectin content of the beverage does not exceed about 1% by weight. It is yet preferably about 0.2% to about 0.9% by weight, yet more preferably about 0.4% to about 0.8% by weight, with a preferred maximum value of about 0.75% by weight.

It should be noted that the present beverage is preferably free of dextrins.

Satiety

The present beverage preferably has a satiating effect and may thus be referred to as a "satiating beverage." Hence the invention relates to the present beverage for use in inducing, stimulating or increasing satiety. The present invention thus also provides for the use of a composition as described herein for the manufacture of a beverage for inducing, stimulating or increasing satiety in humans.

The present invention also provides the present beverage for use in decreasing the sensation of hunger, decreasing appetite, increasing gastric fullness, delaying the return of hunger between two dietary intakes, extending the interval between two dietary intakes, or decreasing food intake after ingestion of foodstuff.

In particular, satiety refers to the absence of a hunger signal, which, when it is present, motivates the search for and consumption of food. After a meal or other dietary intake (food or beverage), the ingested product causes a progressive reduction in the state of

hunger, eventually leading to termination of the dietary intake. This effect is mediated by a complex process, first involving sensory and then cognitive effects before the food is absorbed and then after the food is absorbed. The state of satiety results in fact from metabolic conditions under which the body's cells (particularly certain cells of the hypothalamus) continue to have the capacity to oxidize active glucose in a quantity adequate to satisfy their metabolic needs. According to this hypothesis, hunger thus results from the drop in intracellular availability of glucose. However, given the time required for the intestines to absorb nutrients, in particular glucose, termination of the intake cannot be directly linked to the nutrients consumed during the meal. Other distinct physiological mechanisms must be called upon, namely mechanisms of satisfaction. Satisfaction determines the quantity of food (or energy) consumed during the meal, a quantity which is unconsciously evaluated by the subject's brain via all of the oral, gastric and intestinal stimulations associated with ingestion and resulting from it. Turning to the factors able to modulate satiety, it should be remembered that the duration of the state of satiety depends on the use of active glucose, which in turn depends on the use of the other nutrients. Thus the macronutrient composition of the ingested products and/or their physical and chemical properties is(are) likely to influence the speed of digestive absorption and thus the metabolic use of these products. These characteristics of the ingested product thus constitute factors likely to modify the duration of the satiety the product induces.

Methods for measuring satisfaction and satiety generally include methods for measuring behavioral markers on the one hand, and methods for measuring

peripheral markers on the other hand. In addition, methods for measuring central markers have also been reported. Table 2 below summarizes the most current markers.

Table 2

Markers	SATISFACTION (end of meal)	SATIETY (start of meal)
Behavioral	Food intake	Previous food intake
		Time interval between meals
	Determination of subjective appetite (e.g., hunger and sensation of stomach fullness)	Subjective determination of appetite (e.g., hunger and sensation of gastric fullness)
Peripheral	Stomach distension	Variation of plasma glucose level in the blood (ST)
	Plasma CCK (cholecystokinin) measurement	Plasma leptin (LT) measurement
	Plasma GLP-1 (glucagon-like peptide-1) measurement	Plasma ghrelin (ST & LT) measurement
Central	Brain imaging	Brain imaging

ST: short term

LT: long term

With regard to the potential effect of dietary fiber, it is generally believed that the content and the nature of a product's fiber act to increase its satisfying and satiating character, principally by two mechanisms:

- increase in chewing time and gastric distension, especially for insoluble fibers; and
- slowing down of gastric draining time and intestinal absorption of nutrients, especially for viscosifying water-soluble fibers.

The term "satiating" used herein preferably meets the definitions commonly accepted in the field. Moreover, this concept has been the subject of an increasing number of publications. It might be useful to specify that "satiating" preferably means herein a product which, in the consumer, leads in particular to a decrease in the sensation of hunger, a decrease in appetite, an increase in gastric fullness, a delay in the return of hunger between two dietary intakes, an extension of the interval between two dietary intakes and a decrease in food intake after its ingestion. These various effects can be observed in isolation or in combination, all or in part. Moreover, be reminded that there are methods for measuring markers that make it possible to determine the satiating power of a product, such as described above (see in particular Table 2 above).

In the present case, the satiating effect of the beverage more particularly comprises suppressing or reducing the sensation of hunger between meals, and/or increasing and/or extending the satisfying effect of a meal. However, a long-lasting or irreversible effect on the consumer's metabolism is not sought.

Advantageously, the satiating effect of the beverage appears from about 10 to about 30 minutes after consumption of a volume of at least about 100 ml, preferably of at least about 200 ml, more preferably of at least about 250 ml, 300 ml, 330 ml, 350 ml, 380 ml or 400 ml. A volume of 350 ml will be particularly preferred. This effect occurs, for example, during a period of at least about 2 hours, preferably of about 2 to 3 hours.

According to one embodiment, the present beverage is preferably provided as a packaged, ready-to-use beverage. Optionally, it is possible to envisage a

concentrate to be diluted which, after reconstitution, yields the inventive beverage.

According to one embodiment, the volume of the packaging of said beverage ranges from about 200 ml to about 1500 ml. A small package (e.g., 200 ml, 250 ml, 350 ml) may optionally represent a unit dose, whose complete consumption will be recommended for an optimal effect.

In one embodiment, the present beverage is a beverage with a long shelf life. In this case, the beverage can be stored in a stable way (i.e., without altering its advantageous structural, organoleptic and functional properties) at room temperature (typically, about 18 °C to about 30 °C, preferably about 20 °C to about 25 °C) for about 6 months.

Alternatively, the beverage is a fresh product.

"Fresh product" or "fresh beverage" means a beverage that will be stored between about 0 °C and about 15 °C, preferentially between about 4 °C and about 10 °C. Generally, in the field, "fresh products" are stored between about 4 °C and about 8°C, but those skilled in the art know that the consumer's refrigerator is very often at a temperature between about 4 °C and about 10 °C. This is why the beverage is formulated so as to be able to be stored at such temperatures (between about 4 °C and about 10 °C). It can then be stored for about 1 month.

In a further aspect, the present invention relates to uses of the beverage previously described.

In one embodiment, the invention relates to the use of such a beverage as a snack to drink between meals, i.e., a beverage snack while waiting for a meal.

In one embodiment, the invention relates to the use of the beverage as a supplement to the liquids consumed by an individual (preferably a human) in the course of a day. "The course of a day" means herein a period of about 24 hours, without reference to daytime or nighttime.

In one embodiment, the invention relates to the use of the beverage as part of a diet, for example a low-calorie diet.

Calorie content

Preferably, the beverage of the present invention is low in calories. Thus, yet preferably, its calorie content does not exceed 10 kcal per 100 ml.

Manufacturing method

Another aspect of the present invention relates to a method for preparing a beverage such as described above, with a pH between 3.5 and 5, wherein it comprises at least the steps of:

a. adding to an aqueous matrix at least one agent for controlling pH (such as an agent selected from citric acid, sodium citrate, o-phosphoric acid, sodium phosphate, malic acid, lactic acid and combinations thereof),

b. adding to the composition resulting from step a) at least one low-methoxylated amidated pectin under stirring;

c. heating the composition resulting from step b) to a temperature ranging from about 80 °C to about 140 °C for a period ranging from about 15 seconds to about 10 minutes.

Generally, the temperature ranges for the heating steps are from about 80 °C to about 140 °C, preferably from about 90 °C to about 120 °C, more preferably from 90 °C to 100 °C, even more preferentially about 95 °C. The duration of these steps ranges from about 15 seconds to about 10 minutes, preferably from about 2 minutes to about 6 minutes.

"Stirring" is typically in the range of about 100 rpm to about 700 rpm. Of course, those skilled in the art will be able to apply the stirring speed they wish as long as the essential properties of the beverage are preserved.

The present method can further comprise at least one step consisting of adding, to the matrix or the beverage, at least one additive selected from sweeteners, coloring agents, flavors, flavor enhancers, sugar, preservatives and combinations thereof.

The invention will be better understood in the context of figure 1 below, provided on a purely illustrative basis:

Figure 1: curves representing the results of the evaluation of the satiating properties of a beverage according to the invention.

Various embodiments of the present invention are illustrated in the following examples, which are intended to illustrate, without in any way limiting, the object and the scope of the invention.

EXAMPLES

Example 1: Low-calorie, flavored satiating beverage

A beverage was prepared, comprised of the ingredients listed in table 3 below, in the proportions indicated.

Table 3

Ingredients	%
Pectin*	0.851
Anhydrous citric acid	0.174
Sodium citrate	0.099
Flavors	0.120
Coloring agents	0.091
Sweeteners	0.018
Preservatives	0.018
Volvic water	98.629

* Pectin: The pectin used is a non-standardized LMA pectin (from Danisco) with a mean degree of esterification of 33% and a mean degree of amidation of 18%. Moisture is 12%.

First, the citric acid and the sodium citrate were incorporated into the aqueous matrix (Volvic water). Then after solubilization, the LMA pectin was added under stirring.

Next, the solutions obtained in the preceding step were heat treated at 95 °C for 6 minutes.

The beverage obtained contained 0.75% pectin, based on the amount of pectin on a dry basis.

Measurements of pH, viscosity and gel strength were carried out on the beverages obtained, with methods well known to the person skilled in the art or, as an example, with the viscosity measurement method and the gel strength measurement method previously described (pages 5 and 6).

The measured pH of the beverage was 3.90.

The measured viscosity of the beverage was 12.6 mPa·s.

The measured gel strength was 20.4 g.

Example 2: Flavored satiating beverage containing fruit juices

Table 4

Ingredients	%
Pectin*	0.575
Anhydrous citric acid	0.120
Sodium citrate	0.130
Flavors	0.066
Coloring agents	0.003
Sweeteners	0.022
Preservatives	0.018
Concentrated fruit juice	4.048
Volvic water	95.018

* Non-standardized LMA pectin used identical to that of example 1.

The beverage described in this example was prepared as previously in example 1, with an additional step of adding concentrated fruit juice.

The beverage obtained contained 0.50% pectin, based on the amount of pectin on a dry basis.

Measurements of pH, viscosity and gel strength were carried out on the beverages obtained, with methods well known to the person skilled in the art or, as an example, with the viscosity measurement method and the gel strength measurement method previously described (pages 5 and 6).

The pH of the beverage was 3.72.

The gel strength was 6.2 g.

Example 3: Evaluation of the satiating properties of an inventive beverage containing pectin

The goal of this study was to determine the effect of an inventive beverage on the suppression or the

reduction of the sensation of hunger. This effect was compared with that of a control beverage.

The satiating properties of the beverage containing 0.75% pectin, described in example 1, were evaluated in comparison with a control beverage of flavored water (same formula but without pectin).

The evaluation was carried out by a trained panel of 32 people accustomed to frequently consuming snacks, under the following conditions:

- Each person consumes one product per day, at the time the person is accustomed to having a snack, and only if the person is hungry at that time. The volume consumed is 350 ml, and the beverage is at room temperature when consumed. The order of consumption of the beverages is random.
- Each person evaluates his or her appetite score 10 minutes before consuming the beverage, and then 10, 30, 60, 90 and 120 minutes after consumption.
- The appetite score is evaluated by answering on a scale from 1 to 10 the following 4 questions:
    1. Can you evaluate your level of hunger? (level 1: not hungry at all → level 10: very hungry)
    2. At this moment, do you feel that your stomach is: (level 1: completely empty → level 10: completely full)
    3. At this moment, how do you evaluate your desire to eat? (level 1: I have no desire to eat at all → level 10: I very much want to eat)
    4. What quantity of food do you feel able to eat now? (level 1: nothing at all → level 10: a very large quantity)
- The appetite score at a given time is the mean of the answers to these 4 questions.

- The total appetite score is the mean of the appetite scores observed after consumption of the beverage.
- The beverage containing 0.75% pectin was consumed twice by each panelist. Only the results from the panelists obtaining repeatable scores, 21 panelists out of 32, were included in the analysis. Scores were considered repeatable when the difference in the total appetite score between the 2 evaluations is lower than 2.

The results are presented in figure 1.

The total appetite score was 4.54 for the beverage with pectin, compared to 5.17 for the flavored water control. This difference is significant.

CLAIMS

1. Use of a liquid beverage with a pH between about 3.5 and 5, comprising:
a. low-methoxylated amidated pectin, and
b. less than 20 mg calcium per liter,
as a satiating beverage for humans.

2. The use according to claim 1, wherein said satiating beverage suppresses or reduces the sensation of hunger between meals ingested by human.

3. The use according to claim 1, wherein said satiating beverage increases and/or extends the satisfying effect of a meal ingested by human.

4. Use of low-methoxylated amidated pectin in the manufacture of a liquid beverage for inducing satiety in humans, said beverage having a pH between about 3.5 and 5, and comprising less than 20 mg calcium per liter.

5. A liquid beverage with a pH between about 3.5 and 5, comprising:
a. low-methoxylated amidated pectin, and
b. less than 20 mg calcium per liter.

6. The use according to any of claims 1 to 4, or the beverage according to claim 5, wherein said pH lies between about 3.5 and 4.5, preferably between about 3.5 and 4.2, with a preferred value of about 3.9.

7. The use according to any of claims 1 to 4 and 6, or the beverage according to claim 5 or 6, wherein said

low-methoxylated amidated pectin has a degree of methylation less than or equal to about 50% and a degree of amidation of no more than about 25%.

8. The use according to any of claims 1 to 5, 6 and 7, or the beverage according to any of claims 5 to 7, wherein the pectin content of said beverage does not exceed about 1% by weight, said content being preferably about 0.2% to 0.9% by weight, preferably about 0.4% to 0.8% by weight, even more preferentially about 0.75% by weight.

9. The use according to any of claims 1 to 5 and 6 to 8, or the beverage according to any of claims 5 to 8, wherein the viscosity of said beverage is less than or equal to about 20 mPa·s at a shear rate of 50 s^{-1}, at a temperature of 25°C and at pH above 3,5.

10. The use according to any of claims 1 to 5 and 6 to 9, or the beverage according to any of claims 5 to 9, wherein said beverage comprises at least about 80 wt.% water based on total weight of the beverage.

11. The use according to any of claims 1 to 5 and 6 to 10, or the beverage according to any of claims 5 to 10, wherein the caloric content of said beverage does not exceed about 10 kcal per 100 ml.

12. A method for preparing a liquid beverage with a pH between 3.5 and 5, wherein it comprises at least the steps of:

a. adding to an aqueous matrix at least one agent for controlling pH selected from the group consisting of citric acid, sodium citrate, o-phosphoric acid, sodium

phosphate, malic acid, lactic acid and combinations thereof,

b. adding to the composition resulting from step a) at least one low-methoxylated amidated pectin under stirring;

c. heating the composition resulting from step b) to a temperature ranging from about 80 °C to about 140 °C for a period ranging from about 15 seconds to about 10 minutes.

13. The method according to claim 12, wherein no calcium salt is further added to the composition.

14. Use of a liquid beverage according to any of claims 5 to 11, as a snack to drink between meals.

15. Use of a liquid beverage according to any of claims 5 to 11, as a supplement to the liquids consumed by a human in the course of a day.

16. Use of a liquid beverage according to any of claims 5 to 11, as part of a diet, for example a low-calorie diet.

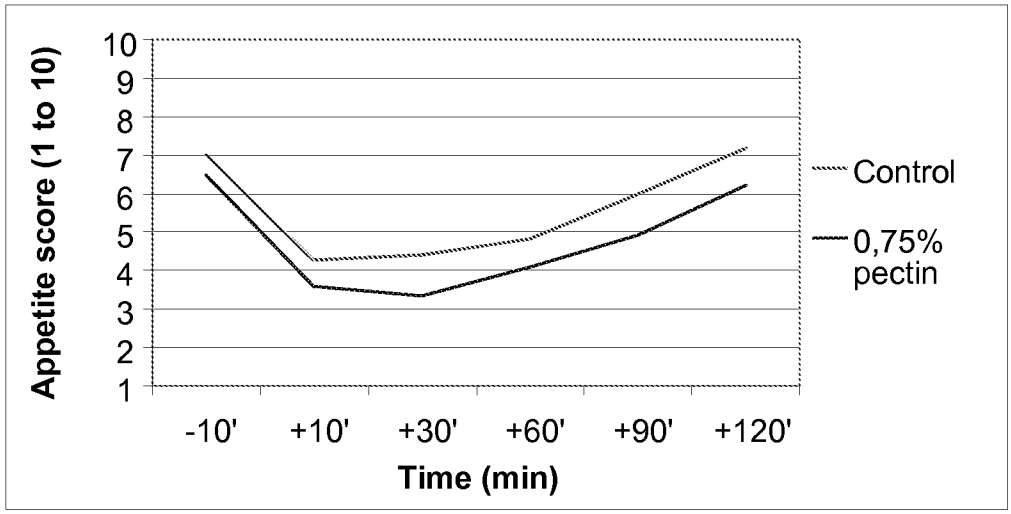
Appetite score (1 to 10)
10
9
8
7
6
5
4
3
2
1
-10'
+10'
+30'
+60'
+90'
+120'
Time (min)
Control
0,75% pectin

FIGURE 1

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2009/052792

A. CLASSIFICATION OF SUBJECT MATTER
INV. A23L1/308 A23L1/0524 A61K31/732 A23L2/52

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A23L A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
2 March 2010	12/03/2010

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Diller, Reinhard

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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2009/052792

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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